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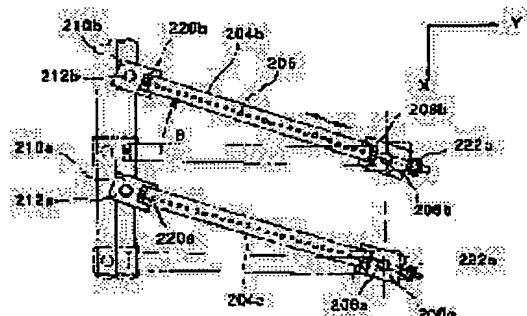
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(54) METHOD AND DEVICE FOR MANUFACTURE OF COLOR FILTER, COLOR FILTER, DISPLAY DEVICE, DEVICE WITH THE DISPLAY DEVICE, AND PRINTING METHOD

(57)Abstract:

**PROBLEM TO BE SOLVED:** To provide a method for manufacturing a color filter for manufacturing the color filter with the high efficiency and high throughput.

**SOLUTION:** Ink is jetted by an ink jet head having a plurality of ink jet nozzles 205 in the direction almost crossing orthogonally the scanning direction X while scanning relatively on a base, and a color filter is manufactured by coloring respective pixels in a manufacturing method, and when the pitch intervals of the jet nozzles 205 of the ink jet head are set as (a) and the pitch intervals in the Y direction crossing orthogonally the scanning direction X for pixels are set as (b), scanning is carried out by inclining the ink jet head to the Y direction crossing orthogonally the scanning direction X by the angle  $\theta$  satisfying the relation of  $b = na \cdot \cos\theta$  (wherein (n) is a positive integer.).



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**CLAIMS**

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**[Claim(s)]**

[Claim 1] While the ink jet head which has two or more ink regurgitation nozzles in the direction which carries out an abbreviation rectangular cross with a scanning direction scans a substrate top relatively, ink Discharge, When it is the approach of manufacturing a light filter by coloring each pixel and pitch spacing of the direction which intersects perpendicularly pitch spacing of said regurgitation nozzle of said ink jet head with said scanning direction of a and said pixel is set to b The manufacture approach of the light filter characterized by only the include angle theta which fills the relation of  $b = na - \cos\theta$  (n is a forward integer) leaning and scanning said ink jet head to the direction which intersects perpendicularly with said scanning direction.

[Claim 2] The manufacture approach of the light filter according to claim 1 characterized by putting in block these two or more ink jet heads, and coloring said substrate by leaning and scanning only said include angle theta using two or more ink jet heads.

[Claim 3] The manufacture approach of the light filter according to claim 2 characterized by making said two or more ink jet heads move slightly in the direction of a list of said regurgitation nozzle according to an individual, and carrying out alignment of the location of said regurgitation nozzle, and the location of said pixel.

[Claim 4] The manufacture approach of the light filter according to claim 1 characterized by only the integral multiple of the pitch spacing a of said regurgitation nozzle shifting said ink jet head in the direction of a list of said regurgitation nozzle when said positive integer n is set or more to two and nonconformity arises in at least one of the regurgitation nozzles in use.

[Claim 5] Said ink jet head is the manufacture approach of the light filter according to claim 1 characterized by having the heat energy generating object for being the head which carries out the regurgitation of the ink using heat energy, and generating the heat energy given to ink.

[Claim 6] The manufacturing installation of the light filter characterized by to provide the include-angle adjustment means for adjusting the include angle to the direction which is equipment which manufactures a light filter by coloring discharge and each pixel for ink while the ink-jet head which has two or more ink regurgitation nozzles in the direction which carries out an abbreviation rectangular cross with a scanning direction scans a substrate top relatively, is established in the base material which supports said ink-jet head, and this base material, and intersects perpendicularly with said scanning direction of said ink-jet head.

[Claim 7] It is the manufacturing installation of the light filter according to claim 6 which said base material can support two or more ink jet heads, and is characterized by the ability for said whose include-angle adjustment means to bundle up the include angle of two or more of said ink jet heads, and adjust it.

[Claim 8] The manufacturing installation of the light filter according to claim 6 characterized by providing further the positioning means for being prepared in said base material and justifying said ink jet head in the direction of a list of said ink regurgitation nozzle.

[Claim 9] It is the manufacturing installation of the light filter according to claim 8 which said base material can support two or more ink jet heads, and is characterized by the ability of said positioning means to adjust the location of two or more of said ink jet heads according to an individual.

[Claim 10] Said ink jet head is the manufacturing installation of the light filter according to claim 6 characterized by having the heat energy generating object for being the head which carries out the regurgitation of the ink using heat energy, and generating the heat energy given to ink.

[Claim 11] While the ink jet head which has two or more ink regurgitation nozzles in the direction which carries out an abbreviation rectangular cross with a scanning direction scans a substrate top relatively, ink Discharge, When it is the light filter manufactured by coloring each pixel and pitch spacing of the direction which intersects perpendicularly pitch spacing of said regurgitation nozzle of said ink jet head with said scanning direction of  $a$  and said pixel is set to  $b$  The light filter characterized by having leaned said ink jet head to the direction which intersects perpendicularly with said scanning direction, and only for the include angle  $\theta$  which fills the relation of  $b=na-\cos\theta$  ( $n$  is a forward integer) having scanned it, and coloring it.

[Claim 12] While the ink jet head which has two or more ink regurgitation nozzles in the direction which carries out an abbreviation rectangular cross with a scanning direction scans a substrate top relatively, ink Discharge, When it is an indicating equipment equipped with the light filter manufactured by coloring each pixel and pitch spacing of the direction which intersects perpendicularly pitch spacing of said regurgitation nozzle of said ink jet head with said scanning direction of  $a$  and said pixel is set to  $b$  The display with which only the include angle  $\theta$  which fills the relation of  $b=na-\cos\theta$  ( $n$  is a forward integer) leans said ink jet head to the direction which intersects perpendicularly with said scanning direction, scans it, and is characterized by equipping one with the colored light filter and the quantity of light adjustable means which makes the quantity of light adjustable.

[Claim 13] While the ink jet head which has two or more ink regurgitation nozzles in the direction which carries out an abbreviation rectangular cross with a scanning direction scans a substrate top relatively, ink Discharge, It is the equipment equipped with the display which has the light filter manufactured by coloring each pixel. When pitch spacing of the direction which intersects perpendicularly pitch spacing of said regurgitation nozzle of said ink jet head with said scanning direction of  $a$  and said pixel is set to  $b$  The light filter with which only the include angle  $\theta$  which fills the relation of  $b=na-\cos\theta$  ( $n$  is a forward integer) leaned said ink jet head to the direction which intersects perpendicularly with said scanning direction, scanned it, and was colored, Equipment equipped with the display characterized by providing a picture signal supply means to supply a picture signal to the display which equips one with the quantity of light adjustable means which makes the quantity of light adjustable, and this display.

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[Translation done.]

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention breathes out ink towards a substrate by the ink jet head, and relates to equipment equipped with the manufacture approach, the manufacturing installation, the light filter, the display, and this display of a light filter for manufacturing a light filter by coloring each pixel.

[0002]

[Description of the Prior Art] In recent years, it is in a liquid crystal display and the inclination which the need of a color liquid crystal display especially increases with development of a personal computer, especially development of a portable personal computer. However, for the further spread, the cost cut of a liquid crystal display is required, and the demand to the cost cut of a light filter with specific gravity high in cost is increasing especially. Although various approaches are tried in order to meet the above-mentioned demand from the former, satisfying the demand characteristics of a light filter, the method of still satisfying all demand characteristics is not established. Each approach is explained below.

[0003] The 1st approach used is a staining technique. [ most ] After a staining technique applies the water soluble polymer ingredient which is an ingredient for dyeing on a glass substrate and carries out patterning of this to a desired configuration according to a photolithography process, it obtains the pattern which was immersed in the dyeing bath in the obtained pattern, and was colored. The light filter layer of R, G, and B is formed by repeating this 3 times.

[0004] The 2nd approach is a pigment-content powder method, and is replaced with a staining technique in recent years. This approach forms on a substrate the photopolymer layer which distributed the pigment, and obtains a monochromatic pattern by carrying out patterning of this. Furthermore, the light filter layer of R, G, and B is formed by repeating this process 3 times.

[0005] There is an electrodeposition process as the 3rd approach. This approach is immersed in the electrodeposition coating liquid which carried out patterning of the transparent electrode on the substrate, and entered [ electrolytic solution / a pigment, resin, ], and electrodeposits the 1st color. This process is repeated 3 times, the light filter layer of R, G, and B is formed, and it calcinates at the end.

[0006] There are print processes as the 4th approach. This approach makes the resin of a heat-curing mold distribute a pigment, and after it distinguishes R, G, and B by different color with by repeating printing 3 times, it forms a coloring layer by carrying out heat curing of the resin. Moreover, it is common to form a protective layer on a coloring layer also in which approach.

[0007] The point common to these approaches is repeating the same process 3 times, in order to color three colors of R, G, and B, and becoming cost high. Moreover, it has the problem that the yield falls, so that there are many processes. Furthermore, in an electrodeposition process, since the pattern configuration which can be formed is limited, with the present technique, it is inapplicable to TFT. Moreover, since definition and smooth nature of print processes are bad, the pattern of a fine pitch cannot be formed.

[0008] The method of manufacturing a light filter using an ink jet method is indicated by JP,59-75205,A, JP,63-235901,A, or JP,1-217320,A in order to compensate these faults. These

approaches dry discharge and each ink for the ink containing the coloring matter of three colors of R (red), G (green), and B (blue) on the substrate of light transmission nature by the ink jet method, and form the coloring pixel section. By such ink jet method, the large cost cut effectiveness can be acquired with simplification of a production process possible [ forming each pixel of R G, and B at once ], and large.

[0009]

[Problem(s) to be Solved by the Invention] By the way, about the print head used for the describing [ above ] ink jet method, although it was desirable to use the multi-nozzle head which has two or more nozzles, there was a trouble that it was difficult to make in agreement conventionally the nozzle pitch of a multi-nozzle and the pitch of a pixel. Moreover, when a light filter was colored with a multi-nozzle and at least one discharge condition became unusual among the nozzles currently used, there was a problem that the whole head had to be exchanged.

[0010] Therefore, the object of this invention is offering equipment equipped with the light filter, display, and display which were manufactured by the manufacture approach, the manufacturing installations, these manufacture approaches, and manufacturing installation of the light filter which can manufacture a light filter by the efficient high throughput, when forming a light filter with an ink jet method.

[0011]

[Means for Solving the Problem] In order to solve the technical problem mentioned above and to attain the object, the manufacture approach of the light filter concerning this invention While the ink jet head which has two or more ink regurgitation nozzles in the direction which carries out an abbreviation rectangular cross with a scanning direction scans a substrate top relatively, ink Discharge, When it is the approach of manufacturing a light filter by coloring each pixel and pitch spacing of the direction which intersects perpendicularly pitch spacing of said regurgitation nozzle of said ink jet head with said scanning direction of a and said pixel is set to b It is characterized by only the include angle theta which fills the relation of  $b = na - \cos\theta$  (n is a forward integer) leaning and scanning said ink jet head to the direction which intersects perpendicularly with said scanning direction.

[0012] Moreover, in the manufacture approach of the light filter concerning this invention, it is characterized by putting in block these two or more ink jet heads, and coloring said substrate by leaning and scanning only said include angle theta using two or more ink jet heads.

[0013] Moreover, in the manufacture approach of the light filter concerning this invention, said two or more ink jet heads are made to move slightly in the direction of a list of said regurgitation nozzle according to an individual, and it is characterized by carrying out alignment of the location of said regurgitation nozzle, and the location of said pixel.

[0014] Moreover, in the manufacture approach of the light filter concerning this invention, when said positive integer n is set or more to two and nonconformity arises in at least one of the regurgitation nozzles in use, it is characterized by only the integral multiple of the pitch spacing a of said regurgitation nozzle shifting said ink jet head in the direction of a list of said regurgitation nozzle.

[0015] Moreover, in the manufacture approach of the light filter concerning this invention, said ink jet head is a head which carries out the regurgitation of the ink using heat energy, and is characterized by having the heat energy generating object for generating the heat energy given to ink.

[0016] Moreover, the manufacturing installation of the light filter concerning this invention While the ink jet head which has two or more ink regurgitation nozzles in the direction which carries out an abbreviation rectangular cross with a scanning direction scans a substrate top relatively, ink Discharge, The base material which is equipment which manufactures a light filter by coloring each pixel, and supports said ink jet head, It is prepared in this base material and characterized by providing the include-angle adjustment means for adjusting the include angle to the direction which intersects perpendicularly with said scanning direction of said ink jet head.

[0017] Moreover, in the manufacturing installation of the light filter concerning this invention, said base material can support two or more ink jet heads, and said include-angle adjustment

means is characterized by the ability to adjust the include angle of two or more of said ink jet heads collectively.

[0018] Moreover, in the manufacturing installation of the light filter concerning this invention, it is prepared in said base material and characterized by providing further the positioning means for justifying said ink jet head in the direction of a list of said ink regurgitation nozzle.

[0019] Moreover, in the manufacturing installation of the light filter concerning this invention, said base material can support two or more ink jet heads, and said positioning means is characterized by the ability to adjust the location of two or more of said ink jet heads according to an individual.

[0020] Moreover, in the manufacturing installation of the light filter concerning this invention, said ink jet head is a head which carries out the regurgitation of the ink using heat energy, and is characterized by having the heat energy generating object for generating the heat energy given to ink.

[0021] While the ink jet head which has two or more ink regurgitation nozzles in the direction which carries out an abbreviation rectangular cross with a scanning direction scans a substrate top relatively, the light filter concerning this invention ink Moreover, discharge, When it is the light filter manufactured by coloring each pixel and pitch spacing of the direction which intersects perpendicularly pitch spacing of said regurgitation nozzle of said ink jet head with said scanning direction of a and said pixel is set to b It is characterized by having leaned said ink jet head to the direction which intersects perpendicularly with said scanning direction, and only for the include angle theta which fills the relation of  $b = na - \cos\theta$  (n is a forward integer) having scanned it, and coloring it.

[0022] While the ink jet head which has two or more ink regurgitation nozzles in the direction which carries out an abbreviation rectangular cross with a scanning direction scans a substrate top relatively, the indicating equipment concerning this invention ink Moreover, discharge, When it is an indicating equipment equipped with the light filter manufactured by coloring each pixel and pitch spacing of the direction which intersects perpendicularly pitch spacing of said regurgitation nozzle of said ink jet head with said scanning direction of a and said pixel is set to b Only the include angle theta which fills the relation of  $b = na - \cos\theta$  (n is a forward integer) leans said ink jet head to the direction which intersects perpendicularly with said scanning direction, scans it, and is characterized by equipping one with the colored light filter and the quantity of light adjustable means which makes the quantity of light adjustable.

[0023] Moreover, equipment equipped with the display concerning this invention While the ink jet head which has two or more ink regurgitation nozzles in the direction which carries out an abbreviation rectangular cross with a scanning direction scans a substrate top relatively, ink Discharge, It is the equipment equipped with the display which has the light filter manufactured by coloring each pixel. When pitch spacing of the direction which intersects perpendicularly pitch spacing of said regurgitation nozzle of said ink jet head with said scanning direction of a and said pixel is set to b The light filter with which only the include angle theta which fills the relation of  $b = na - \cos\theta$  (n is a forward integer) leaned said ink jet head to the direction which intersects perpendicularly with said scanning direction, scanned it, and was colored, It is characterized by providing the display which equips one with the quantity of light adjustable means which makes the quantity of light adjustable, and a picture signal supply means to supply a picture signal to this display.

[0024]

[Embodiment of the Invention] Although 1 suitable operation gestalt of this invention is hereafter explained to a detail with reference to an accompanying drawing, the outline of this operation gestalt is explained before that.

[0025] Two or more head mounts using a multi-nozzle type ink jet head with two or more nozzles are used for this operation gestalt about the manufacturing installation of the light filter by the ink jet method.

[0026] The above-mentioned head mount has the device in which whenever [ two or more setting-angles / of a head ] is changed simultaneously, and the device in which a location can be adjusted in the direction of vertical scanning according to a head individual.

[0027] When coloring the pixel of a light filter by the ink jet method, fundamentally, using the multi-head which has two or more nozzles at fixed spacing (pitch), it is colored a main scanning direction using the nozzle suitable for a pixel pitch, then, a head or a substrate is moved in the direction of vertical scanning, and coloring of a main scanning direction is repeated continuously.

[0028] Since the pitch of a nozzle is finer than the pitch which is a pixel in the case of the ink jet head of the multi-nozzle of this operation gestalt, it will draw using the nozzle set several. Moreover, when the multiple of the pitch of a pixel and the pitch of a nozzle does not suit, it is not vertical to a main scanning direction in the include angle of an ink jet head, and it sets so that a certain include angle may be given and it may double with the pitch of a pixel.

[0029] Under the present circumstances, it becomes possible to double simultaneously a pixel pitch and the pitch of the activity nozzle of an ink jet head efficiently by establishing the device in which two or more heads with the same nozzle pitch are rotated simultaneously.

[0030] Moreover, it becomes possible to double the nozzle location of two or more heads with the location of a request of the pixel of a light filter by establishing the device which can move slightly the ink jet head according to each in the direction of vertical scanning. two or more heads — R, G, and B — if it is made the head for each three colors, it will come to be able to perform 3 color simultaneous coloring, and the effectiveness of light filter manufacture will increase.

[0031] Furthermore, if at least one defect occurs among activity nozzles and a head will be shifted in the direction of vertical scanning according to the above-mentioned jogging device, coloring becomes possible in the combination of another nozzle, and the frequency of head exchange can be reduced.

[0032] Hereafter, the concrete configuration of the manufacturing installation of the light filter of 1 operation gestalt is explained.

[0033] Drawing 1 is the schematic diagram showing the configuration of 1 operation gestalt of the manufacturing installation of a light filter.

[0034] XYtheta stage where 51 had been arranged at the equipment stand and 52 has been arranged on a stand 51 in drawing 1 , The light filter substrate with which 53 was set on the XYtheta stage 52, the light filter with which 54 is formed on the light filter substrate 53, The head mount in which 55 built each ink jet head of R (red), G (green), and B (blue) which color a light filter 54, The controller by which 58 controls actuation by the whole light filter manufacturing installation 90, the teaching pendant (personal computer) whose 59 is the display of a controller, and 60 show the keyboard which is the control unit of the teaching pendant 59. In addition, although it is made to scan by moving a light filter substrate side to an ink jet head with this operation gestalt, it is good also as a configuration to which an ink jet head end is moved to a substrate.

[0035] Drawing 2 is the block diagram of the control controller of the light filter manufacturing installation 90. The teaching pendant whose 59 is the I/O means of the control controller 58, the display as which 62 displays information, such as existence of the progress situation of manufacture and the abnormalities of a head, and 60 are control units (keyboard) which direct actuation of the light filter manufacturing installation 90 etc.

[0036] The controller by which 58 controls actuation by the whole light filter manufacturing installation 90, The interface with which 65 delivers data with the teaching pendant 59, ROM which has memorized the control program for CPU by which 66 controls the light filter manufacturing installation 90, and 67 to operate CPU66, RAM 68 remembers production information etc. to be, the regurgitation control section by which 70 controls the regurgitation of the ink into each pixel of a light filter, It connects with a controller 58 and the stage control section by which 71 controls actuation of the XYtheta stage 52 of the light filter manufacturing installation 90, and 90 show the light filter manufacturing installation which operates according to the directions.

[0037] Next, drawing 3 is the perspective view having shown the internal configuration of a head mount 55, and drawing 4 is the top view which looked at drawing 3 from the upside.

[0038] In drawing 3 and drawing 4 , 204a, 204b, and 204c are the ink jet heads of a multi-nozzle, respectively, and can usually equip now with three ink jet heads, head for R (red) 204a, head for



G (green) 204b, and head 204c for B (blue). 205 is a nozzle (since a nozzle is in the underside of an ink jet head, although it is not visible, by drawing 4, the expedient top continuous line of explanation has shown in practice), and two or more nozzles are located in a line with the longitudinal direction of a head in the same pitch. The ink jet heads 204a, 204b, and 204c are supported by Holders 208a, 208b, and 208c in the end section, respectively, and these holders are supported rotatable in the level surface to the head mount 55 centering on the revolving shafts 206a, 206b, and 206c fixed to the head mount 55. Moreover, the ink jet heads 204a, 204b, and 204c are supported by Holders 210a, 210b, and 210c in the other end, and these holders are supported rotatable in the level surface centering on revolving shafts 212a, 212b, and 212c to the slide member 214. The slide member 216 is supported movable in the direction of X, and the direction of Y to the head mount 55, and is energized in the direction of arrow-head A with the spring 216. The tangent screw 218 is formed in the spring 216 of a head mount 55, and the location of an opposite hand, and the slide member 216 is moved in the direction of X by rotating this tangent screw 218. Only the include angle theta of arbitration (as opposed to a Y-axis) can lean simultaneously three ink jet heads 204a, 204b, and 204c by this to the location shown in drawing 4 with a broken line, and the inclination to a scanning direction is adjusted. Moreover, in Holders 210a and 210b and 210c, compression springs 220a, 220b, and 220c are formed, and the ink jet heads 204a, 204b, and 204c are energized in the direction of drawing Nakamigi. On the other hand, compression springs 220a, 220b, and 220c are countered, tangent screws 222a, 222b, and 222c are formed in Holders 208a, 208b, and 208c, and each ink jet head can be justified in the direction of arrow-head B by rotating this tangent screw.

[0039] In addition, if you set a head mount 55 in equipment so that the straight line which connects the revolving shafts 206a, 206b, and 206c of each head to a main scanning direction X may become in the same direction, it is convenient at the time of adjustment.

[0040] At the time of coloring of a actual light filter, two or more heads are simultaneously rotated centering on the head revolving shafts 206a, 206b, and 206c, and the include angle theta of a head is adjusted so that the pitch of a desired nozzle (nozzle for coloring) and the pitch of a pixel may be doubled. If a nozzle pitch is set to a (micrometer) and a pixel pitch is set to b (micrometer) at this time, only the include angle theta which fills  $b=na-\cos\theta$  (however, n forward integer) will lean a head. Next, the fine adjustment screws 222a, 222b, and 222c are adjusted, and the location of a nozzle is doubled with the location of each pixel pattern of R, G, and beta.

[0041] Next, drawing 5 is drawing showing the structure of the ink jet head arranged at a head mount 55. Although three ink jet heads are prepared corresponding to three colors of R, G, and B, since these three heads are the same structures, respectively, drawing 3 R> 3 and drawing 4 are shown in drawing 5 on behalf of one of these three heads.

[0042] In drawing 5, the outline configuration of the ink jet head 204a is carried out from the heater board 104 which is the substrate with which two or more heaters 102 for heating ink were formed, and the top plate 106 put on this heater board 104. Two or more deliveries (nozzle) 108 are formed in the top plate 106, and the liquid route 110 of the shape of a tunnel which is open for free passage to this delivery 108 is formed behind the delivery 108. Each liquid route 110 is isolated with the next liquid route by the septum 112. Each liquid route 110 is connected common to one liquid ink room 114 in that back, ink is supplied to the liquid ink room 114 through the ink feed hopper 116, and this ink is supplied to each liquid route 110 from the liquid ink room 114.

[0043] Alignment of the heater board 104 and the top plate 106 is carried out, and they are assembled by condition like drawing 5 so that each heater 102 may come to the location corresponding to each liquid route 110. In drawing 5, although only two heaters 102 are shown, the heater 102 is arranged one [ at a time ] corresponding to each liquid route 110. And in the condition of having been assembled like drawing 5, if a predetermined driving pulse is supplied to a heater 102, film boiling arises in the ink on a heater 102, and air bubbles are formed, and ink will be extruded by the cubical expansion of these air bubbles from a delivery 108, and it will be breathed out. Therefore, by controlling the magnitude of control, for example, power, for the driving pulse added to a heater 102, it is possible to adjust the magnitude of air bubbles and the

volume of the ink breathed out from a delivery can be controlled free.

[0044] Drawing 6 is drawing for explaining how changing the power applied to a heater in this way, and controlling the discharge quantity of ink.

[0045] With this operation gestalt, in order to adjust the discharge quantity of ink, it is made as [ impress / to a heater 102 / two kinds of constant-voltage pulses ]. As it is indicated in drawing 4 as two pulses, they are a preheating pulse and the Maine heat pulse (only henceforth a heat pulse). A preheating pulse is the minimum pulse width  $t_5$  required in order to be a pulse for preceding carrying out the regurgitation of the ink actually, and warming ink to predetermined temperature and to carry out the regurgitation of the ink. It is set as the short value. Therefore, ink is not breathed out by this preheating pulse. A preheating pulse is added to a heater 102 by raising the initial temperature of ink even to fixed temperature for always making regularity ink discharge quantity when impressing a behind fixed heat pulse. Moreover, even when the temperature of ink is adjusted beforehand and the same heat pulse is impressed by adjusting the die length of a preheating pulse conversely, it is also possible to change the discharge quantity of ink. Moreover, it also has the work which brings forward the time standup of the ink regurgitation when impressing a heat pulse, and improves responsibility by warming ink in advance of impression of a heat pulse.

[0046] On the other hand, a heat pulse is the minimum pulse width  $t_5$  required in order to be a pulse for making ink breathe out actually and to carry out the regurgitation of the above-mentioned ink. It is set up for a long time. Since the energy which a heater 102 generates is a thing proportional to the width of face (impression time amount) of a heat pulse, it can adjust dispersion in the property of a heater 102 by adjusting the width of face of this heat pulse.

[0047] In addition, it becomes possible to adjust spacing of a preheating pulse and a heat pulse and to adjust the discharge quantity of ink also by controlling the diffusion condition of the heat by the preheating pulse.

[0048] The discharge quantity of ink is possible also for controlling by adjusting the impression time amount of a preheating pulse and a heat pulse, and possible also by adjusting impression spacing of a preheating pulse and a heat pulse so that the above-mentioned explanation may show. Therefore, it becomes possible by adjusting impression spacing of the impression time amount and the preheating pulse of a preheating pulse and a heat pulse, and a heat pulse if needed to adjust the responsibility over the impression pulse of the discharge quantity of ink, or the regurgitation of ink free.

[0049] Next, adjustment of the discharge quantity of this ink is explained concretely.

[0050] For example, the case where the discharge quantity of ink as shown in drawing 6, when Deliveries (nozzle) 108a, 108b, and 108c add the same energy differs is explained. In detail, it shall be constant temperature, and when fixed energy is impressed, for the ink discharge quantity of nozzle 108a, the ink discharge quantity of 36pl(s) (pico liter) and nozzle 108b shall be [ the ink discharge quantity of 40pl(s) and nozzle 108c ] 40pl(s), and the resistance of heater 102c corresponding to 200 ohms and nozzle 108c in the resistance of heater 102b corresponding to heater 102a corresponding to nozzle 108a and nozzle 108b shall be 210ohms. And I want to double all the discharge quantity of each nozzle 108a, 108b, and 108c with 40pl(s).

[0051] Although what is necessary is just to adjust the width of face of a preheating pulse and a heat pulse in order to adjust the discharge quantity of each nozzle 108a, 108b, and 108c to the same amount, various things can be considered about the combination of the width of face of this preheating pulse and a heat pulse. Here, the amount of the energy generated by the heat pulse shall be set up so that it may become the same with three nozzles, and adjustment of discharge quantity shall be performed by adjusting the width of face of a preheating pulse.

[0052] First, what is necessary is just to impress the electrical-potential-difference pulse of the same width of face as Heaters 102a and 102b, in order to make the same energy generated by the heat pulse, since the resistance of heater 102b of heater 102a and nozzle 108b of nozzle 108a is the same 200ohms.  $t_5$  which mentioned above the width of face of an electrical-potential-difference pulse here  $t_3$  [ long ] It sets up. On the other hand, Nozzles 108a and 108b are the width of face  $t_1$  of the preheating pulse of heater 102b in heater 102a, in order to make [ many ] discharge quantity of nozzle 108a, since the discharge quantity when adding the same

energy differs from 36pl and 40pl(s). t2 [ long ] A preheating pulse is added. If it does in this way, the discharge quantity of Nozzles 108a and 108b can be arranged with the same 40pl(s).

[0053] On the other hand, since the resistance of heater 102c of nozzle 108c is 210ohms higher than the resistance of other two heaters 102a and 102b, in order to generate the same energy as other two heaters from heater 102c, it needs to lengthen width of face of a heat pulse.

Therefore, t3 which mentioned above the width of face of a heat pulse here t4 [ long ] It has set up. Moreover, it is t1 that what is necessary is just to make it the same as heater 102b since the discharge quantity of the nozzles 108b and 108c when adding fixed energy about the width of face of a preheating pulse is the same. The preheating pulse of width of face is added.

[0054] The same quantity of ink can be made to breathe out from three nozzles 108a, 108b, and 108c from which the ink discharge quantity when adding resistance and fixed energy as mentioned above differs. Moreover, it is also possible to change the discharge quantity of ink intentionally by the same technique. In addition, a preheating pulse is used for decreasing with [ of the regurgitation for every nozzle ] a rose.

[0055] Next, drawing 7 is drawing having shown the production process of a light filter. The production process of a light filter 54 is explained with reference to drawing 7.

[0056] Drawing 7 (a) shows the glass substrate 1 equipped with the black matrix 2 which constitutes the light transmission section 9 and the protection-from-light section 10. First, on the substrate 1 with which the black matrix 2 was formed, in itself, although it is lacking in ink receptiveness, while parent ink is formed under a certain conditions (for example, an optical exposure or an optical exposure, and heating), the resin constituent which has the property hardened under a certain conditions is applied, it prebakes if needed, and the resin constituent layer 3 is formed ( drawing 7 (b)). The methods of application, such as a spin coat, a roll coat, a bar coat, a spray coat, and a DIP coat, can be used for formation of the resin constituent layer 3, and it is not especially limited to it.

[0057] Next, the part 6 which was made to form a part of resin layer into parent ink ( drawing 7 (c)), and was formed into parent ink by the resin constituent layer 3, and the part 5 which is not formed into parent ink are formed by performing pattern exposure in the resin layer on the light transmission section 9 beforehand using a photo mask 4 ( drawing 7 (d)). Moreover, while an ink jet head carries out the multiple-times scan of the substrate top relatively, in case the regurgitation of the ink is carried out, all in the case where a relative scan is performed, and the case of performing a relative scan by fixing a substrate and moving an ink jet head are possible by fixing an ink jet head and moving a substrate.

[0058] Each color ink of R (red), G (green), and B (blue) is breathed out in the resin constituent layer 3 with an ink jet method after that, it colors at once ( drawing 7 (e)), and ink is dried if needed. Although the method by heat energy or the method by mechanical energy is held as an ink jet method, any method can be used suitably. As ink to be used, especially if it can use as an object for ink jets, it is not restricted, and as a coloring agent of ink, what suited the transparency spectrum required of each pixel of R, G, and B is suitably chosen from various colors or a pigment. Moreover, liquefied ink and solid ink are usable. In addition, although it may be guttate when the resin constituent layer 3 adheres to the ink breathed out from an ink jet head, it is desirable not to dissociate from an ink jet head guttate, but to adhere with a column-like gestalt.

[0059] Subsequently, the resin constituent layer 3 colored by performing optical exposure or optical exposure, and heat-treatment is stiffened, and a protective layer 8 is formed if needed ( drawing 7 (f)). Different conditions from conditions [ in / for stiffening this resin constituent layer 3 / previous parent ink-ized processing ], for example, the light exposure in an optical exposure, are enlarged, heating conditions are made severe, or the approach of using an optical exposure and heat-treatment together can be adopted.

[0060] In addition, if it has ink receptiveness under a certain conditions and can harden as a resin constituent which can be hardened by one [ at least ] processing of an optical exposure or an optical exposure, and heating, all will be usable and a cellulosic or its denaturation objects, such as for example, acrylic resin, an epoxy resin, silicon resin, hydroxypropylcellulose, hydroxyethyl cellulose, methyl cellulose, and a carboxymethyl cellulose, etc. will be mentioned as

resin.

[0061] In order for these resin to advance crosslinking reaction with light or light, and heat, it is also possible to use a photoinitiator (cross linking agent). As a photoinitiator, dichromate, a bis-azide compound, a radical system initiator, a cation system initiator, an anion system initiator, etc. are usable. Moreover, these photoinitiators can be mixed or it can also be used combining other sensitizers. In addition, in order to advance crosslinking reaction more, you may heat-treat after an optical exposure.

[0062] The resin layer containing these constituents is dramatically excellent in thermal resistance and a water resisting property, and can bear enough the elevated temperature or washing process in an after process.

[0063] Moreover, in this example, although the example which used the ink absorbing layer (resin constituent layer) is shown, between a black matrix or an electrode, it is an ink jet method and direct ink may be shot without being able to create similarly and using a resin layer, even when the black matrix is formed in the substrate.

[0064] although it is desirable as a location of the nozzle of the ink jet heads 204a, 204b, and 204c to have located more than one in a line at fixed spacing on the same flat surface, the shape of a straight line as shown in drawing 8 has as the way of being located in a line — as [ show / in drawing 9 / carry out and ] — being alternate . What is necessary is for a head to lean only a predetermined include angle and just to set it to a head mount 55 so that a nozzle may become fixed spacing to the direction of vertical scanning. By rotating simultaneously two or more heads 204a, 204b, and 204c with a tangent screw 218 so that it may double with the pitch of the pattern of the pixel of the target light filter, a head mount 55 can be adjusted so that the pitch of the integral multiple of spacing of a nozzle 205 and the pitch of a pixel may be doubled.

[0065] Furthermore, it can color now using many nozzles by making it move slightly in the direction of vertical scanning (direction where the nozzle was located in a line) with tangent screws 222a, 222b, and 222c, and adjusting so that the nozzle of two or more heads 204a, 204b, and 204c may come on the pixel which a request wants to color.

[0066] Moreover, by shifting the distance of the integral multiple of spacing of a nozzle for the head in the direction of vertical scanning (direction where the nozzle was located in a line), when the nozzle which exists while in use becomes a defect as shown in drawing 8 (a) (or [ the discharge quantity of ink decreases or it becomes the non-regurgitation ]), even if it does not exchange heads, it becomes possible to use it further ( drawing 8 (b)).

[0067] Thus, the light filter which has a resin layer on a substrate and has two or more coloring sections colored by the color from which the resin layer differs, and the non-coloring section is manufactured.

[0068] Drawing 10 and drawing 11 are the sectional views showing the basic configuration of the color liquid crystal display 30 incorporating the above-mentioned light filter.

[0069] Generally a color liquid crystal display sets the light filter substrate 1 and the opposite substrate 21, is full, and is formed by enclosing the liquid crystal compound 18. Inside one substrate 21 of a liquid crystal display, TFT (Thin Film Transistor) (un-illustrating) and the transparent pixel electrode 20 are formed in the shape of a matrix. Moreover, inside another substrate 1, a light filter 54 is installed so that the color material of RGB may arrange in the location which counters a pixel electrode, and the transparent counterelectrode (common electrode) 16 is formed on it at the whole surface. Although the black matrix 2 is usually formed in the light filter substrate 1 side (refer to drawing 10 ), it is formed in the TFT substrate side which counters in a BM (black matrix) on-array type liquid crystal panel (refer to drawing 11 ). Furthermore, the orientation film 19 is formed in the field of both substrates, and a liquid crystal molecule can be made to arrange in the fixed direction by carrying out rubbing processing of this. Moreover, polarizing plates 11 and 22 have pasted the outside of each glass substrate, and the gap (about 2-5 micrometers) of these glass substrates is filled up with the liquid crystal compound 18. Moreover, generally as a back light, the combination of a fluorescent lamp (un-illustrating) and a scattered plate (un-illustrating) is used, and the example at the time of applying such a liquid crystal display that displays by operating a liquid crystal compound as an optical shutter to which the permeability of back light light is changed to an information

processor is explained with reference to drawing 12 thru/or drawing 14.

[0070] Drawing 12 is the block diagram showing the outline configuration at the time of applying the above-mentioned liquid crystal display to a word processor, a personal computer, facsimile apparatus, and the information processor that has a function as a reproducing unit.

[0071] Among drawing, they are the control section which controls the whole equipment, and 1801 are equipped with CPUs and various I/O Ports, such as a microprocessor, and a control signal, a data signal, etc. are outputted to each part, or they are controlling by inputting the control signal and data signal from each part. 1802 is the display section and the image data read by various menus, document information, and the image reader 1807 is displayed on this display screen. 1803 is the transparent pressure-sensitive-type touch panel prepared on the display section 1802, and can perform the item input Sagitta label location input on the display section 1802 etc. by pressing the front face with a finger etc.

[0072] It is FM (Frequency Modulation) sound-source section, and 1804 memorizes the music information created by the music editor etc. as digital data to the memory section 1810 or external storage 1812, it is read from these memory etc. and performs FM modulation. The electrical signal from the FM sound section 1804 is changed into audible sound by the loudspeaker section 1805. The printer section 1806 is used as a printing terminal of a word processor, a personal computer, facsimile apparatus, and a reproducing unit.

[0073] 1807 is the image reader section which reads manuscript data in photoelectricity and inputs them, is prepared into the conveyance path of a manuscript and performs read of the other various manuscripts of a facsimile manuscript or a copy manuscript.

[0074] 1808 is the transceiver section of facsimile transmission of the manuscript data read in the image reader section 1807, and the facsimile (FAX) which receives and decodes the sent facsimile signal, and has an interface function with the exterior. 1809 is the telephone section which has various telephone functions, such as a usual telephone function, a usual answering machine function, etc.

[0075] 1810 is ROM which memorizes a system program, a manager program other application programs, etc. a character font, a dictionary, etc., the application program loaded from external storage 1812, document information, and the memory section which contains a Video RAM etc. further.

[0076] 1811 is the keyboard section which inputs document information, various commands, etc.

[0077] 1812 is the external storage which uses a floppy disk, a hard disk, etc. as a storage, and the application program of document information, music or speech information, and a user etc. is stored in this external storage 1812.

[0078] Drawing 13 is typical general-view drawing of the information processor shown in drawing 12.

[0079] Among drawing, 1901 are a flat-panel display using the above-mentioned liquid crystal display, and display various menus, graphic form information, document information, etc. On this display 1901, the front face of a touch panel 1803 can perform a coordinate input and an item assignment input by pressing with a finger etc. 1902 is a hand set currently used when equipment functions as telephone. It connects with the body through the code removable, and a keyboard 1903 can perform various document functions and various data inputs. Moreover, various function key 1904 grades are prepared in this keyboard 1903. 1905 is insertion opening of the floppy disk to external storage 1812.

[0080] The manuscript which 1906 is the form installation section which lays the manuscript read in the image reader section 1807, and was read is discharged from the equipment back. Moreover, in facsimile reception etc., it is printed from an ink jet printer 1907.

[0081] When functioning considering the above-mentioned information processor as a personal computer or a word processor, the various information inputted from the keyboard section 1811 is processed by the control section 1801 according to a predetermined program, and is outputted to the printer section 1806 as an image.

[0082] When functioning as a receiver of facsimile apparatus, according to a predetermined program, reception of the facsimile information inputted from the FAX transceiver section 1808 through the communication line is carried out by the control section 1801, and it is outputted to

the printer section 1806 as a receiving image.

[0083] Moreover, when functioning as a reproducing unit, a manuscript is read and the read manuscript data are outputted to the printer section 1806 by the image reader section 1807 as a copy image through a control section 1801. In addition, when functioning as a receiver of facsimile apparatus, the manuscript data read by the image reader section 1807 are transmitted to a communication line through the FAX transceiver section 1808, after transmitting processing is carried out by the control section 1801 according to a predetermined program.

[0084] In addition, it becomes possible [ the information processor mentioned above is good also as one apparatus which built the ink jet printer in the body, as shown in drawing 14 , and ] in this case to raise portable nature more. In this drawing, a corresponding sign is given to the part which has the same function as drawing 13 .

[0085] Next, the example which colored the light filter with the coloring equipment which has the include angle of a head as shown in drawing 3 and drawing 4 , and the adjustment device of a location is explained.

[0086]

[The 1st example] Using what mixed the photoinitiator 2% to what was made to dissolve in ethylcellosolve the copolymer in which MMA (methyl methacrylate) and N-NAM (n-methylol acrylamide) carried out equivalent mixing, and adjusted viscosity on the blue plate glass substrate which established the black matrix, it applied to 1-micrometer thickness by the roll coater, and pattern formation of an ink absorbing layer was performed. Then, when it was made to dry for 2 minutes at 120 degrees C, the pattern dimension was set to 80 micrometers and the clearance on a black matrix was set to about 10 micrometers.

[0087] That with which 256 nozzles were located in a line in the shape of a straight line by 400dpi (63.5-micrometer spacing) was used for the used ink jet head. R, G, and B — the head mount was equipped with every 1 three heads, respectively, and the head anchoring include angle theta was adjusted to about 19.1 degrees. next, it tunes finely in the direction of a nozzle list, and a nozzle is located in a line in 240-micrometer pitch every four — as — moreover, R, G, and B — each head was positioned so that 80 micrometers of activity nozzles of each head might shift at a time.

[0088] The predetermined pattern which consists of three colors of R, G, and B was formed with the ink jet method on the transparence substrate which prepared said ink absorbing layer using the ink jet manufacturing installation equipped with this head mount.

[0089] Thus, when the created light filter for liquid crystal was observed with the optical microscope, the light filter without color nonuniformity, white NUKE, etc. was obtained. And coloring time amount was shortened by 60 or more times rather than the case where one nozzle colors at a time by three colors. moreover, the wearing time amount of the head to an ink jet manufacturing installation — R, G, and B — it was shortened more remarkably than the case where each ink jet head is set independently.

[0090]

[The 2nd example] When 20 light filters of 15 inch size (1280x1024 pixels) are created like the 1st example, a part of ink discharge quantity of the head of R has decreased (28ng->25ng). Then, although few differences to the concentration of a filter were seen when 63.5 micrometers of the R head were shifted in the direction of a nozzle list and drawing was continued further, as shown in drawing 8 R> 8 (b), that which is satisfactory as a light filter property was obtained. It completed within 3 minutes and productivity of alignment adjustment time amount of a head improved remarkably compared with the case where heads are exchanged one by one.

[0091]

[The 3rd example] When the liquid crystal panel shown in drawing 10 was created and driven using the light filter created in the 2nd example, highly precise color display was possible. Moreover, next eye when changing a nozzle etc. has created the liquid crystal panel of the level which cannot be checked with the naked eye.

[0092]

[The 4th example] Pattern formation by which the 110-micrometer pattern is repeated was performed using the ink absorbing layer containing a photoinitiator like the 1st example. The

clearance between \*\* ink nature was set to 15 micrometers at this time.

[0093] Using the same head mount as the 1st example, by changing a head anchoring include angle into about 30 degrees, it was able to be used every six nozzles and 42 lines were able to be colored simultaneously. By repeating this, it became possible to color a 21 inches light filter in 90 seconds. Moreover, it became possible to adjust to changing into the head location for 15 inches, and the head location for 21 inches by the time amount loss for about 5 minutes.

[0094]

[The 5th example] The head mount of the same structure was equipped using the head which has 2600 nozzles by the consistency of 360dpi on an ink jet head, and the 15 inches light filter was colored. When the head anchoring include angle was set as about 31.7 degrees, each color 640 nozzle was used and it colored at this time, the light filter for 15 inches became possible [ manufacturing a substrate by 20 second), including / only scanning twice and / (alignment ].

[0095]

[The 6th example] Even if it uses the head (600dpi) with which the nozzle as shown in drawing 9 was arranged in the shape of \*\*\*\*\*, a light filter can be manufactured with an ink jet method like the 1st example by adjusting the include angle of a head similarly.

[0096] In this example, the 10 inches high performance light filter was able to be created by setting the head anchoring include angle theta as 27.6 degrees, and using a nozzle every four.

[0097] In addition, this invention is the range which does not deviate from the meaning, and can be applied to what corrected or transformed the above-mentioned operation gestalt.

[0098] Although especially this invention explained the printing equipment of the method which it has [ method ] means (for example, an electric thermal-conversion object, a laser beam, etc.) to generate heat energy as energy used in order to make the ink regurgitation perform, and makes the change of state of ink occur with said heat energy also in an ink jet recording method, according to this method, it can attain the densification of record, and highly minute-ization.

[0099] About the typical configuration and typical principle, what is performed using the fundamental principle currently indicated by the U.S. Pat. No. 4723129 description and the 4740796 description, for example is desirable. Although this method is applicable to both the so-called mold on demand and a continuous system On the electric thermal-conversion object which is especially arranged corresponding to the sheet and liquid route where the liquid (ink) is held in the case of the mold on demand By impressing at least one driving signal which gives the rapid temperature rise which supports recording information and exceeds film boiling Since make an electric thermal-conversion object generate heat energy, the heat operating surface of a recording head is made to produce film boiling and the air bubbles in the liquid (ink) corresponding to this driving signal can be formed by 1 to 1 as a result, it is effective. A liquid (ink) is made to breathe out through opening for regurgitation by growth of these air bubbles, and contraction, and at least one drop is formed. If a pulse configuration is carried out, since growth contraction of air bubbles will be appropriately performed instantly in this driving signal, the regurgitation of a liquid (ink) excellent in especially responsibility can be attained, and it is more desirable.

[0100] As a driving signal of this pulse configuration, what is indicated by the U.S. Pat. No. 4463359 description and the 4345262 description is suitable. In addition, if the conditions indicated by the U.S. Pat. No. 4313124 description of invention about the rate of a temperature rise of the above-mentioned heat operating surface are adopted, further excellent record can be performed.

[0101] The configuration using the U.S. Pat. No. 4558333 description and U.S. Pat. No. 4459600 description which indicate the configuration arranged to the field to which a delivery which is indicated by each above-mentioned description, a liquid route, and the heat operating surface other than the combination configuration (a straight-line-like liquid flow channel or right-angle liquid flow channel) of an electric thermal-conversion object are crooked as a configuration of a recording head is also included in this invention. In addition, it is good also as a configuration based on JP,59-138461,A which indicates the configuration whose opening which absorbs the pressure wave of JP,59-123670,A which indicates the configuration which uses a common slot as the discharge part of an electric thermal-conversion object to two or more electric thermal-

conversion objects, or heat energy is made to correspond to a discharge part.

[0102] Furthermore, any of the configuration which fills the die length with the combination of two or more recording heads which are indicated by the description mentioned above as a recording head of the full line type which has the die length corresponding to the width of face of the maximum record medium which can record a recording device, and the configuration as one recording head formed in one are sufficient.

[0103] In addition, the recording head of the exchangeable chip type with which the electric connection with the body of equipment and supply of the ink from the body of equipment are attained, or the recording head of the cartridge type with which the ink tank was formed in the recording head itself in one may be used by the body of equipment being equipped.

[0104] Moreover, since effectiveness of this invention is further made to stability, it is desirable to add the recovery means against a recording head established as a configuration of the recording device of this invention, a preliminary auxiliary means, etc. If these are mentioned concretely, it is effective in order to perform record stabilized by performing the preheating means by the capping means, the cleaning means, the application of pressure or the attraction means, the electric thermal-conversion object, the heating elements different from this, or such combination over a recording head, and reserve regurgitation mode in which the regurgitation different from record is performed.

[0105] In this invention example explained above, although ink is explained as a liquid Even if it is ink solidified less than [ a room temperature or it ], what is softened or liquefied at a room temperature may be used. Or by the ink jet method, since what carries out temperature control is common as a temperature control is performed for ink itself by within the limits below 70-degreeC more than 30-degreeC and it is in the stability regurgitation range about the viscosity of ink, ink should just make the shape of liquid at the time of activity record signal grant.

[0106] In addition, in order to prevent positively by making the temperature up by heat energy use it positively as energy of the change of state from a solid condition to the liquid condition of ink, or in order to prevent evaporation of ink, the ink which solidifies in the state of neglect and is liquefied with heating may be used. Anyway, ink liquefies by grant according to the record signal of heat energy, and this invention can be applied also when using the ink of the property which will not be liquefied without grant of heat energy, such as that by which liquefied ink is breathed out, and a thing which it already begins to solidify when reaching a record medium. In such a case, ink is good for a porosity sheet crevice or a breakthrough which is indicated by JP,54-56847,A or JP,60-71260,A also as liquefied or a gestalt which counters to an electric thermal-conversion object in the condition of having been held as a solid. In this invention, the most effective thing performs the film-boiling method mentioned above to each ink mentioned above.

[0107]

[Effect of the Invention] As explained above, according to this invention, two or more heads were rotated simultaneously, the include angle was adjusted, and it became possible from carrying out fine control according to each head individual, and making it move in the direction of a nozzle list to manufacture the light filter of many forms at a high speed by the same light filter manufacturing installation.

[0108] Moreover, since continuation of coloring can be performed only by making it move in the direction of a nozzle list without carrying out head exchange, even if a part of activity nozzle in a head becomes a defect, productivity improves remarkably.

[0109] Furthermore, the resolution which an ink jet method has, and precision are seasoned with the resolution of the photolithography by which detailed patternizing was carried out, and precision, and the light filter pattern of high resolution can be obtained.

[0110] The color device excellent in many properties can be formed with sufficient productivity, without affecting the function of a device, and a formation process by this, even when the light filter of this invention is used for various color device configurations.

[0111]



[Translation done.]

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## DESCRIPTION OF DRAWINGS

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### [Brief Description of the Drawings]

[Drawing 1] It is the schematic diagram showing the configuration of 1 operation gestalt of the manufacturing installation of a light filter.

[Drawing 2] It is drawing showing the configuration of the control section which controls actuation of the manufacturing installation of a light filter.

[Drawing 3] It is the perspective view showing the internal configuration of a head mount.

[Drawing 4] It is the top view which looked at drawing 3 from the upper part.

[Drawing 5] It is drawing showing the structure of the ink jet head used for the manufacturing installation of a light filter.

[Drawing 6] It is drawing for explaining how changing the power applied to a heater and controlling the discharge quantity of ink.

[Drawing 7] It is drawing having shown the production process of a light filter.

[Drawing 8] It is drawing showing a solution when a defect occurs for the nozzle of an ink jet head.

[Drawing 9] A nozzle is drawing having shown the example which used the head alternately located in a line.

[Drawing 10] It is the sectional view showing the basic configuration of the color liquid crystal display incorporating the light filter of 1 operation gestalt.

[Drawing 11] It is the sectional view showing the basic configuration of the color liquid crystal display incorporating the light filter of 1 operation gestalt.

[Drawing 12] It is drawing having shown the information processor with which a liquid crystal display is used.

[Drawing 13] It is drawing having shown the information processor with which a liquid crystal display is used.

[Drawing 14] It is drawing having shown the information processor with which a liquid crystal display is used.

### [Description of Notations]

52 XYTheta Stage

53 Glass Substrate

54 Light Filter

55 Head Mount

58 Controller

59 Teaching Pendant

60 Keyboard

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[Translation done.]

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